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See the sidebar article: "Come Out With Your Hands Up!"

by Robert Matchette

Aviation has enjoyed numerous advances in aerodynamics, power plant efficiency and reliability, flightdeck automation, and navigation systems. However, ATC/aircraft communications have changed little over the years, and still exhibit the age-old limitations of natural and human-made interference that can distort messages, difficulties with language barriers, and the problems of pronunciation and phraseology. At the same time, the volume of ground-to-air (ATC/aircraft) communication has increased dramatically because of the remarkable increase in air traffic. Satellite links and discrete communication technology promise communications solutions for the future--until then, aviation is forced to deal with the communications status quo. One of the greatest problems inherent in voice communications today is the use of **non-standard phraseology**.

The ASRS database was searched for records which made reference to phraseology in their narratives, and 260 reports were reviewed. Many reported incidents resulted in little more than momentary confusion or annoyance for pilots and controllers. However, nearly half the reports involved near mid-air collisions, loss of standard ATC separation, runway transgressions, or other conflicts with potentially serious safety consequences.

Phraseology 101

Examples of non-standard phraseology occur during all flight phases. What follows are examples of common non-standard phraseology used in each phase of flight (which may or may not have had potentially serious consequences), and suggested alternate wording which may have prevented the incident.

Preflight

Watch out, you may get what you ask for!

- "I called for clearance to St. Louis as follows: 'Clearance delivery, company ident, ATIS info, federal aid to St. Louis.' Federal aid was meant to mean FAA clearance in a joking fashion. The Controller misinterpreted this to mean that we were being hijacked and called the FBI and airport police...I used no 'standard' phraseology to indicate nor was it my intent to indicate we had a hijacking...I will use absolutely standard phraseology in the future..." (# 248982)

Conventional wisdom (and the AIM) dictate the use of a less provocative phrase: "ABC Clearance, company ident, I-F-R St. Louis." Although the AIM does not suggest advising Clearance Delivery that you have the current ATIS, individual locations may request that information, as well as the gate number when applicable.

Pushback/Taxi

You have to push prior to taxi...right?

After a pilot receives an IFR clearance, the next interaction with ATC is often a pushback request. What may be construed as authorization by some may not be by others.

- "Called for pushback Gate ABC Miami. Ground Control said 'Advise ready for taxi, use caution, company pushing out of XYZ.' Maintenance pushed us back with a turn and we blocked the inner taxiway. At that time Ground Control said we had not been cleared for push. I felt that since he said advise ready for taxi, we had been cleared for push. Suggest if he did not want us to push he should have said so and not have mentioned taxi." (# 627717)

At many large airports, some gates may be controlled by ATC, while others, out of direct sight of controllers, may be under the control of the air carrier--aircraft movements in this case will be governed by the letter of agreement between the carrier and ATC. It is not clear, in this instance, who had jurisdiction for this gate area. If this gate was ATC-controlled, the controller should have said "Hold" or "Pushback approved." If the gate was the carrier's responsibility, the flight crew erred in entering the taxiway during pushback. In any event, the message here is clear--controllers need to provide clear instructions and messages, and pilots need to ask for clarification if there is any confusion or opportunity for misinterpretation.

Taxi Out

To get there, I have to cross...

- "Ground cleared me to taxi to Runway 23. The taxi route was on the west side of the runway. While taxiing, Ground called and instructed me to conduct runup on the east side of Runway 23, so I taxied across active end of Runway 23. When across, Ground called and said, 'You just crossed end of active Runway 23 without a clearance to do so.' "(# 123722)

Although the reporter certainly did not a have a specific clearance to cross the runway, the Controller contributed to the incident. A less ambiguous clearance would have been, "Aircraft ident, plan to conduct runup on east side of Runway 23, hold short of Runway 23." After an aircraft gets to a runway (assuming that it was the one intended), the pilot's awareness is often heightened, and the probability of a misunderstanding should be reduced...right?

Into Position

No, your other right

- "Cleared for takeoff Runway 17 at Colorado Springs. Took runway to use total length, required back-taxi approximately 300 feet. We were at maximum weight. Turning left on runway for short back-taxi, Tower said, 'Turn right on runway for departure.' (In my mind, what other direction would we turn [after turning left to back-taxi]?) Light aircraft turning final for Runway 12. As we back-taxied, Tower sent light aircraft around, and we began takeoff roll. Tower chastised us for not complying with his instructions to 'turn right on the runway.'...If Tower had wanted us to takeoff from the intersection, perhaps he should have cleared us for an intersection departure or depart from the intersection..." (# 197294)

The reporter could have prevented any misunderstanding by informing the controller prior to reaching the runway that full length would be required for takeoff. In many situations, pilots and controllers giving each other as much advance information as possible will reduce the likelihood of miscommunication. In this case, the phraseology in question occurred at a busy time for the flight crew. Unfortunately, last-minute changes often occur at the highest workload phases of flight. In these situations, a sense of urgency can often cause pilots and controllers to neglect to clarify misconceptions as they might have done if there were no apparent time constraints. Schedule pressure plus a complex clearance can equal instructions in non-standard phraseology, as the next reporter discovered.

Takeoff/Initial Climb

When do we turn?

- "While in position and holding on Runway 22L, we received the following clearance: 'Turn left heading 140, cleared for takeoff Runway 22L, will call your turn in the air.' I queried the Captain about the turn and he agreed that ATC would initiate our turn. As we passed 1,000 feet AGL, the Tower said, 'Further left heading 110 degrees, tighten your turn'...He [could] have said, 'Left heading 140, cleared for takeoff Runway 22L, will call further turn in the air.' " (#141940)

A query directed to the Tower could have alleviated any misunderstanding, which in this case resulted in less than standard separation from another departing aircraft. The possibility for confusion abounds when specific numerical values are assigned as headings, airspeeds or altitudes. At times, the importance of standard phraseology can become critical, as the following report illustrates:

Climb

230 what?

- "...we finally contacted Departure passing through approximately 6,500 feet climbing. The Controller's response was a hurried, 'Roger, maintain 2-3-0.' The Captain responded, 'Roger, 2-3-0.' At this point, flight level 230 was selected on the aircraft's MCP (Mode Control Panel)...It was at this point that the Controller said that we had been assigned 8,000 feet. The Captain replied that we had been assigned flight level 230. The Controller's response was, 'I said two-hundred thirty knots, sir.'...Those numbers can imply heading, altitude or airspeed." (# 127825)

According to the AIM, when controllers issue a speed restriction, they are to use the word "speed" or "knots" in the clearance. However, once again, the flight crew could have asked for clarification before this altitude deviation took place.

Cruise

Cruise flight is often the time when flight crews can relax, since there is usually little cockpit activity compared to other phases of flight. This lack of activity can inspire flight crews to let down their guard and disregard things they might notice if they were more focused on specific tasks. Non-standard phraseology contributed to this incident in which a Controller attempted to verify a flight's altitude after a hand-off.

Roger what?

- "Cruise altitude was 7,000 feet assigned by New York Center. Hand-off was about 11 miles northwest of HAR VOR. The Captain checked in with MDT Approach and reported level at 7,000 feet. The Controller replied, 'Verify level at 8,000 feet.' The Captain replied, 'Roger'...The Controller presumed we were at 8,000 feet at check-in and tried to clarify our altitude, but was misled by our Captain's response to the inquiry ('Roger' was incomplete phraseology)."(# 229932)

AIM defines the term "Roger" as, "I have received all of your last transmission," and states that it "should not be used to answer a question requiring a yes or no answer." However, the term is constantly misused in communications, often resulting in misunderstanding, annoyance, or more serious consequences for both pilots and controllers.

Descent

Roger this...

- "Center issued a clearance to descend to 5,000 feet MSL as the flight neared the entry point [of special use airspace]. This clearance was read back and the Controller was advised that the flight was, 'Canceling IFR at this time.' The Center responded with, 'Roger.' This response did not seem appropriate and the Controller was extremely busy...As we descended through 3,000 feet MSL, Center advised us that we were only cleared to 5,000 feet MSL and then asked us

if we had canceled. We repeated that we had, and that we had heard his acknowledgment of our cancellation...'Roger' is probably the most misused term in flying today."(# 140258)

Roger that...

- "Planned descent for normal crossing restriction of 11,000 feet and 250 knots at FLATO. Issued 250 knots now, during descent. 250 knots now made the crossing restriction almost impossible. Busy frequency to get in a word that we wouldn't make the altitude. Finally got in a word, and ATC responded, 'Roger.' Did 'roger' mean it was OK or what?" (# 89792)

When pilots realize that an ATC clearance cannot be complied with, they are required to advise ATC as soon as possible. Timely notification is critical to prevent problems which could compromise separation from other traffic. Once pilots have advised ATC that a restriction cannot be made, they are often very anxious for a Controller's response either to relieve them of responsibility or to assign a new restriction. Roger is not the only response that offers little in the way of an answer, as the next report illustrates.

Approach and Landing

In an effort to keep each other well-informed, controllers and pilots might supply information that is out of the ordinary in order avoid potential problems or to help clear up any questions that might arise. Sometimes, these out-of-the-ordinary advisories can create more confusion or consternation than they were intended to alleviate. Consider this next report:

What are all those fire trucks doing?

- "We arrived on final approach to Runway 22L at EWR airport with less than 7,000 pounds of fuel. The airplane ahead of us did not vacate the runway in time, so a go-around was accomplished... The Captain asked me to declare 'minimum fuel', which I did. New York radar then asked us how much fuel we had remaining. The Captain said, 'We need to be on the ground in 10 minutes.' I repeated that to New York...New York radar said, 'Understand you have 10 minutes fuel remaining.' I said, 'Negative.' Apparently, New York had declared an emergency and called out the fire trucks anyway." (# 246925)

After the Avianca Airlines accident on Long Island, NY, ATC sensitivity about fuel exhaustion was justifiably heightened. (See "Great Expectations" by Jeanne McElhatton, an excellent article in Issue # 3 of ASRS Directline about minimum fuel situations.) The flight crew might have alleviated this Controller's concerns by accurately conveying their situation. They could have said, for instance, "...we would like to be on the ground in about 10 minutes--just so we don't get too far into our fuel reserves."

Landing and Rollout

Once a successful approach and landing are accomplished, pilots tend to relax a little bit. The challenge, danger, and possibility of error are dramatically reduced, right?

- "...was instructed to enter right downwind for 25R. Landed and during rollout was instructed, 'Left next taxiway,' but at this point was unable to positively identify the next opening as a taxiway. ...Immediately after receiving this instruction, another aircraft (which was already holding in position on 25R) was cleared for takeoff 25R. Hearing this caused me to panic. I was afraid of crossing Runway 30 which I had been given landing instructions to hold short of. ...Sometimes it's 'left this taxiway', sometimes it's 'left next taxiway', which if you are very close to a taxiway (as I was), might be construed as the taxiway after the one you have almost passed..."(# 103105)

When arrivals to an airport are tightly spaced and aircraft are in position for departure, communications can get especially hectic. Controllers often try to assist a pilot by giving what they think are simple, direct instructions. Although the intentions are good, identifying the specific taxiway designation in the instruction would help minimize misunderstanding. Pilots can assist the controller by advising ATC as soon as possible of any known restrictions on where they can turn off the runway.

Taxi In

If you're not sure, ask...

- "...on rollout at Moline, IL, Controller instructions heard and read back as, 'Clear at taxiway E, stay with Tower to ramp.' Upon reaching and entering Runway 31, we noted another aircraft in takeoff position...Tower said, '[Air Carrier X], you were supposed to hold short.' I responded 'I thought we were cleared to the ramp with you.' He said, 'No, you were cleared to hold short on Runway 31.' I never recall hearing or reading back such a clearance..." (# 194811)

As in many cases, without reviewing the ATC tapes, no one will ever know whose account of this incident is correct. However, unless it is absolutely clear that a taxi clearance includes a crossing clearance, a confirmation of the clearance as well as a visual check of the runway must occur to prevent this kind of incident.

The Human Factor

So where is the problem?

Problems with communications technique are evident on both sides of the radio link. Although controllers are mandated to adhere to standard phraseology, there are certainly examples of controllers using non-standard phrases. Pilots are required by regulation to read back certain phases of a clearance, but are given, and often exercise, more latitude in phraseology than their controller counterparts. In the final analysis, human factors issues, such as loss of situational awareness, readback/hearback, anticipatory problems, response to schedule pressure, etc., affect controllers and pilots alike. Following are some typical examples of flawed communications technique with which most pilots can identify.

Too Casual

In the following report, the pilot's phraseology is too casual for the task at hand:

- "The low altitude Controller issued the aircraft a clearance of: 'Cross WHIGG intersection at and maintain one-five thousand, and two-five-zero knots.' The pilot responded with: '[Air Carrier X], we'll do it.' At WHIGG the aircraft's Mode C altitude readout on the Controller's scope indicated 16,500 feet MSL, and the ground speed readout indicated that the aircraft was still well above the 250 knot restriction. When the Controller questioned the pilot,...the pilot responded with an unconcerned, '...yeah, I know...' " (# 105229)

Sentence Construction

Even when the proper words are uttered over the frequency, the inflection or cadence used can significantly change the meaning.

- "Center cleared us to 'Descend to 13,000 at MAJEK (pause) 250 knots at 14,000 feet'...Something didn't sound right, so my response on readback was, 'I understand, flight cleared to descend to 13,000, slow to 250 knots upon reaching 14,000 feet.' Center response was 'Roger.'...About that same time an aircraft behind us was cleared, 'Cross MAJEK at 14,000, 250 knots, then descend to 13,000 feet.' We were at approximately 13,700 feet, 250 knots when the copilot and I both decided that the Center wanted us at 14,000 feet until MAJEK..." (# 113536)

Fatigue and CRM

A high-workload phase of flight, frequency congestion, heavy traffic, and fatigue sometimes combine with less than optimum cockpit resource management to push pilots and controllers to their limits. When non-standard phraseology enters the picture, things can quickly fall apart as they did in this airborne conflict near Denver.

- "The Controller was very busy, on the verge of overload...The Controller, with no warning or explanation called, '[Air Carrier X], the traffic you're following is turning final for Runway 26, a company [jet].' We looked at our 3 o'clock position and saw a [jet] inbound for the runway. My F/O, without asking me, called the traffic in sight [to ATC]...Just prior to our turn to final the Controller called with a frantic, 'You followed the wrong aircraft, turn right heading 270 degrees and climb to 5,000 feet'...I feel this was caused by improper phraseology and procedures, heavy traffic, crew fatigue, 12th leg in 27 hours, and a breakdown in cockpit communications." (# 248002)

Say it Again, Sam

It should be evident to anyone listening to an ATC frequency that non-standard phraseology is common. Whether it is a significant factor in aviation incidents is open to discussion. The reports reviewed here are but a fraction of those in the ASRS database. Regardless of the magnitude of the problem, there certainly are ways to help avoid these problems in the first place, or to minimize their effect on day-to-day operations.

1. If a clearance or instruction seems the least bit out of the ordinary or ambiguous, flight crews

should not hesitate to clarify the clearance or instruction until no doubt remains.

2. Pilots and controllers should make a conscious effort to use standard phraseology in all ATC communications. In addition, inflection and the placement of pauses in a transmission may be significant.

3. A recurrent training session is the perfect venue for pilots to review the AIM and other pertinent resources discussing standard phraseology.

4. Before the first trip as a flight crew, the Captain should take the initiative to discuss phraseology issues as they pertain to inter-crew as well as ATC communications. This may help to prevent misunderstandings among the crew, and to heighten alertness for non-standard phraseology used by ATC. It is equally important for flight instructors to discuss these issues with their students, since frequent intra-cockpit communications take place during instructional sessions.

Come Out With Your Hands Up!

The Pilot-Controller Glossary defines squawk as "activate specific mode/code/function on the aircraft transponder." Therefore, "squawk your altitude" is a controller's instruction to activate the altitude function of a Mode 3/A transponder.

Squawking 7500 is the international code to indicate a hijacking. The AIM instructs pilots of hijacked aircraft to set 7500 into the aircraft transponder, which triggers a flashing "HIJK" in the aircraft's data block on the Controller's radar screen. The Controller will then ask the pilot to "verify squawking 7500." If the pilot verifies the code or makes no response at all, the Controller will not ask further questions, but will continue to flight-follow, respond to pilot requests, and notify appropriate authorities. These procedures are exactly the ones that occurred, as this reporter can testify:

- "Burbank assigned me a squawk code. Several minutes later the Controller asked me my altitude and I responded 7,500 feet. He told me to squawk my altitude. I replied, 'Squawking 7500', and the Controller confirmed my code...After landing, Ground directed me to a specific parking area, and I was immediately surrounded by three police cars with a number of officers pointing their weapons at me...They frisked me and handcuffed me. They really roughed me up...I would suggest that Controllers never use the terminology 'squawk your altitude.' " (# 147865)

This poor pilot forgot to review his AIM, which would have informed him that:

> "Code 7500 will never be assigned by ATC without prior notification from the pilot that his aircraft is being subjected to unlawful interference [hijacking]. The pilot should refuse the assignment of Code 7500 in any other situation and inform the controller accordingly."

In fact, ATC will not assign any transponder codes beginning with 75, 76, or 77 for anything other than what they are meant for. Code 7512, or 7622, or 7752, for example, will not be assigned because the first two numbers trigger the computer--the last two digits make no difference.